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HOWARD CAMPBELL, Editor

Volume 7

AUGUST, 1934

THE ORIENTAL CRAFTSMAN ...

Number 3



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Magazine for ormation Machine ES, Inc. Shop xecutives

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AUGUST, 1934

The Oriental Craftsman

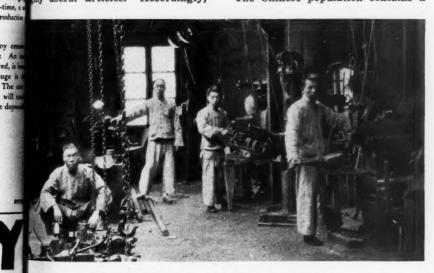
othe Engineer or Mechanic of the Western World, the Chinese Craftsman, with his Unique Methods and in Many Cases Primitive Equipment, Is An Interesting Study

By WALTER BUCHLER

I G-II HE Chinese civilization is one of the oldest of which there is any RBI ord. To the inventive ability of Chinese we are indebted for gunwder, sugar, paper, and many other hly useful articles. Accordingly, ematic ga

it would seem that the Oriental mechanic would be quick to grasp the principles upon which the Occidental methods are founded, but such is rarely the case.

The Chinese population contains a



Chinese mechanics at work in a Shanghai machine shop.

great many native craftsmen who operate in a small way to produce the utensils, small fixtures, trinkets and other metal commodities that are required in the every-day life of their people. Their shops are small, indeed, and their machines and tools are of quite primitive design, though it must be conceded that with this equipment they turn out some marvelous work, after their own fashion.

Chinese machine shops, in the modern sense of the word, exist mostly

Making a rope sheave for a cotton mill. The machine is a pit-lathe, and the operation is that of boring the hub.

where the European or American influence prevails to a large degree, and such shops will usually be found in connection with shipyards, marine repair shops and docks, and factories that have been established in the larger Oriental cities.

In these places the working forces are comprised almost entirely of native workmen, supervised by European or American superintendents. The superintendent usually transmits his orders to the workmen through the native foreman, who, of count in our thine understands English well enough thine orders and to reput him understand the orders and to repo ffers in an intelligible manner.

The Oriental mechanic serves heap apprenticeship in much the same we say as any other tradesman, his to shick varying from three to five year ione. The physique of the Oriental is n lish equal to that of the Englishman are American, and when assigned heavy work, he invariably slows de Although he learns to handle mo

> tools properly, he is entirely weaned away f his Oriental customs habits; thus, although un a steady workman, he insist upon assuming a c fortable position while w ing.

A fitter, for instance, be found squatting by side of the job in a comf able position while filing doing other work that a be done better while st The fact that he slowing the job is of no in the portance to him. The China iso of the more intelligent de tree t is traditionally of a philoday is phical turn of mind, and quite unable to understa the necessity for speed as floor is regarded in America. his m

is regarded in America. his machine is the hub.

An English firm operation in the Orient imported from the firm of the machine for weaving placed terms in colors. Eventually the machine arrived, but the necessary draings and instructions to explain to operation of the machine were ming. As the purchaser wanted use it as soon as possible, the agrave his No. 1 fitter the job of finding out how the machine worked. Applied though he succeeded at last, the fit spent over a month finding out who foreign the various parts were for. cessar the various parts were for. Although not naturally ambition The

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of count occasionally happens that the enough thinese mechanic becomes the boss to rep of his own establishment. Someone fiers him some used machines at a serves the progres and if he has any money, same the sets up in some small building his to hich may have served as a confective year interpretation of the served is his miniature machine shop may not shann are more than 100 square feet of

small native shops consists mostly of repairs to small Chinese steamers, launches and machinery from smaller shops and factories. The prime factor in such jobs is cheapness. The small overhead, the small space, and the fact that the native workmen will work longer hours at smaller pay for one of their own race makes it possible for the native shop to obtain

> enough business to keep going. The shop owner is not too particular as to the kind of material that he uses, however, and quite capable of using mild steel where tool steel should be used, because the mild steel is cheaper.

> It seems difficult for the Oriental workman to accept



of no it in he pictures shown here and at right tre taken of oppo-te ends of the main y in a Shanghai

peed a floor space, and

mbition The business that comes to these



the possibilities of high speed steel for cutting tools, and while his workmanship and accuracy may be beyond question, his speed will be nominal. In England or America an automatic machine that is built to perform six operations will be set up to make use of the six spindles. But if not watched, the Chinese workman will use the machine to perform only three or four operations. Machines that perform several operations and thus make it possible to operate with fewer men do not appeal to these people.

duplicate parts in large quantities Such production work as is being don is being turned out on ordinar lathes and other standard machine

There is an ample supply of me chanics in Shanghai and other coacities of China. A number of the have been trained in the foreign ship yards and shops attached to lare

engineering plant while the others n ceived their train ing in the smal native Chines shops. The training in the small sho is fairly good, b is usually confine to small work. En cept in rare stances, mechani who are capable doing heavy wor are only to found in the h engineering shop where such wor is constantly being done. A Chine machine hand ean from \$1 to \$1.50 day.

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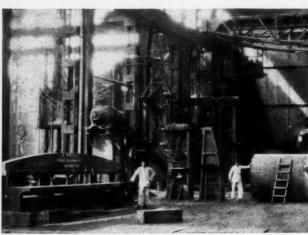
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where such wo is constantly ben done. A Chine machine hand can from \$1 to \$1.50 day.

Patternmakers h larger places as Shanghai me

such larger places as Shanghai me be called upon to make a pattern from any part of an engine—be it gas line or steam—as well as to do other minor work. Not having the most ern equipment that is found in pattern and machine shops in America and Europe, the work may tall longer, but the work will be satisfactory.

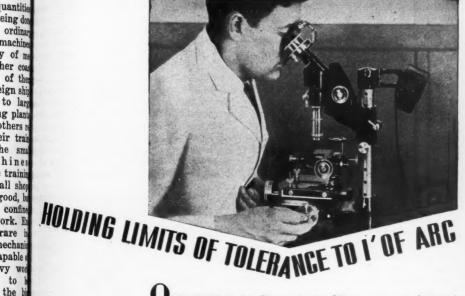
A Chinese patternmaker invariable starts from the inside and works of That is the method they are taught in the shippards, the method have been adapted to the peculiarities the Oriental mind. Were a national patternmaker to attempt to start from the outside and work toward the case.



Not all the tools are ancient; in the center of the illustration can be seen a hydraulic riveting machine. This picture was taken in a shipbuilding plant in Shanghai.

The Chinese machine hand is usually quite proud of his ability and prestige, and will often work out a way to get a job done upon his own initiative and without asking for any advice, though sometimes to the detriment of the job in hand. The Chinese are taking to Western ways more now, however, than has been the case in the past. The increasing use of the automobile and other modern mechanical units is making necessary the use of more modern equipment for repair work.

Production machinery has not yet come into use in China, as there is very little metal manufacturing of a type that requires the production of



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ter, he would soon become confused due to the inability of the native to visualize anything that he cannot see.

Ninety per cent of their labor is by hand, and they usually take about three times as long on a job as an American patternmaker, due to the primitive tools used. They will not use any other, and are set against the introduction of modern tools because such tools are faster and thus tend to put some of their men out of work. Stiff competition in Shanghai is, however, compelling the larger plants to introduce modern tools and force their workmen to use

force their workmen to use

them.

In recent years sand and loam have been introduced, but previously sand alone was used and the method was primitive: the molder simply dug a hole in the sand, put the pattern in, set a box corresponding to the cope over the pattern, filled it with sand, and rammed hard. The cope would then be lifted off, the pattern taken out, the cope replaced, and the metal poured. The castings produced by this method were very difficult to machine.

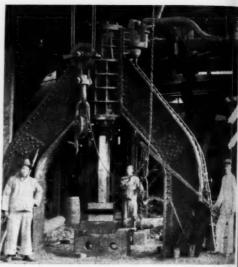
The quality of sand obtained in Shanghai is inferior to that used in America or England. The sand comes from Ningpo and the loam from Hankow, but mixed together they form a passable "mud" as the Chinese call it. The Chinese

molder is somewhat backward at making collapsible cores for small work. At work he squats for sand molding on the floor, but stands up when doing a large job of loam molding.

The Chinese method of smelting iron is astonishing, but the amount of iron that can be turned out of a Chinese cupola is still more surprising. The cupola is usually made of

a sheet metal cylinder, lined with fire clay and bricks and with a grate across the bottom. As the iron melt, it flows into a receptacle at the bottom of the cupola. When enough has been melted, the plug is punctured and the metal is run into a ladle.

In the smelting of brass the Chinese foundryman is far behind the time. In the shop that the writer saw, a Root blower was being used to provide forced draft for melting the brass and by the time the metal was ready to pour, approximately 50 per cent of it had gone up the chimney. When



The Oriental hammerman is as adept at the operation of the steam hammer as his American brothers.

a foreigner is having a casting made, he usually has to stand over the molders to see that the metal is melted with a natural draft so that the metal will be melted without vaporizing it.

The Chinese blacksmith uses a forge made by setting a cylinder of iron in the ground and covering it with a primitive sort of fire-grate over which

he heats the work. Draft is supplied with fire to the fire by means of a bellows a grate operated by a small boy. The necesn melts. sary heat is obtained, but the method the bot. ugh has is slow.

At coppersmithing, however, the unctured dle. Chinese artisan excels. He will at-Chinese tempt the patching of any kind of a e times, job, and will do it well. saw, a used for this work resemble those used in America, and the methods are to prohe brass Copper is much used for similar. s ready utensils, decorative designs, and other cent of things, but once made, a copper arti-When cle will be used as long as there is anything left to patch. Hence the coppersmith is kept quite busy mak-

> ing repairs. The Chinese are good at electrowelding, even on difficult work. There is a great deal of boiler work done in Shanghai and Hong Kong, both from the ships that put in at these ports and from the mills in and around the cities. Boilers are usually in need of much repairing, due to the fact that they are allowed to go so long before the repairs are made. And boilers "go up" in China more often than in America, for the same reason.

The tools

This statement applies particularly to Chinese factories where no foreign supervisors or engineers are employed. The Chinese employer or engineer is rarely well enough posted to know when a boiler has reached

the dangerous stage.

Platers (men who repair or replace plates on a steel vessel), riveters, caulkers, and drillers are employed in Shanghai much in the same manner as in other shipyards, but the trades work under different conditions. The workmen are paid at piece rates and are supervised by a No. 1 Chinese contractor, who quotes his employers a price for the entire job. The contractor may have been with his firm many years and has probably worked m from a job as rivet heater or helper.

After having become expert as a plater, and as soon as he has accumulated some working capital, he The No. 1 will start contracting. contractor has sub-contractors, each of whom quotes the No. 1 contractor on the work that comes under his jurisdiction, such as boiler work, riveting, welding, and so on. totals their bids, adds his percentage, and then quotes the firm. By following this procedure, estimating comes much easier to an engineering firm as they are able to figure their profits as based upon the actual cost instead of an estimated cost. The method is practicable and in many cases preferable, because labor is cheap in China and the Chinese work much better and cheaper when working for a contractor of their own race than they would if working for the engineering firm direct.

There are some highly skilled ship platers in Shanghai who are unsurpassed in marking off plates of any shape or fashion. They fashion and shape the plates by primitive methods, forming them by the use of holes in the ground. Flanging machines and presses are not found here, and it would probably be folly to import them as labor is cheap and plentiful. The best men earn as much as \$2.50 to \$3 a day, which is considered very good pay in China.

The transportation problem is solved to a large extent by the use of the Chinese common porters, or coolies, who carry their loads by means of bamboo poles slung across their shoulders. They will carry anything that they can lift, provided it is not top-heavy. Mechanical means of transportation do not appeal to the Chinese; they insist upon going about it in their own way, and taking their own time. "East is East and West is West", and the Chinese are in no hurry to adopt western ideas and methods.

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Fits and Tolerances

By J. G. HOMMEL

M. & P. Engineering, Westinghouse Electric & Mfg. Company

TECHNICAL literature contains considerable data on the amount of allowance necessary for turning and boring operations in order to achieve a certain degree of tightness (or clearance, as the case may be) between two mating parts, as, for example, between a motor shaft and a pinion. Quite a few of the tables of allowances and tolerances available, however, go to such a high degree of refinement that they become unworkable when they are transmitted to the shops for everyday production, which is quite different from the manufacturing of a high-class tool or a precision instrument, where time and cost are generally of minor consideration.

The following tables of Fits and Tolerances have for some time been in practical use with a large manufacturing concern and are giving good results, while at the same time allowing the maximum tolerance to take care of slight inaccuracies and variations in machine tools of the various types and kinds and the never negligible presence of the element of hu-

man error.

The figures shown supersede others, which, although computed by people conversant with the product; had not proved practical. The figures illustrated opinions of competent individuals, but could not often be realized in commercial manufacturing without unnecessary sacrifice of time and cost, tho without adding appreciably to the quality of the product. For obtaining values that had been found satisfactory in machining, assembling

and in operation, numerous measurements were taken to find out what had actually been done by the work men and what the actual dimensions were on the parts that had passed rigid inspection. In taking measurements of bores, an instrument was used which gives direct readings on a large scale. This instrument—the Zeiss "Passimeter"—is extremely accurate and is so designed that no opportunity is afforded for variations due to individual handling in taking the measurements.

The tables shown are accompanied by lists of definitions of the terms used, together with examples illustrating methods of specifying allowances and tolerances on the drawings. It has been the object to make the tolerances for a bore somewhat larger than for the corresponding turned part, as it is much easier to make and measure a turned part to close limits than it is the bore.

The unilateral system has been used; i. e., the bore is made basic, or from zero to plus, and the necessary fit allowance to the turned part

is added.

There are some exceptions to this rule, for various reasons. Where cold rolled stock is used, supplied by the mills to minus tolerances, the tolerances for the corresponding mounting have to be adjusted accordingly. Some of the tables had to meet the needs of certain types of equipment or apparatus, but it may be said that similar conditions will be encountered in different industries. In some

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cases it may be necessary to extend the range of a certain table either upward or downward, but in general it should be possible to do so without the necessity of formulating additional tables.

In specifying the dimensions of a shaft on a drawing, it has been customary to specify the larger dimension first, thus: 4.005, 4.003, as the tendency of the workman is generally to try for the dimension appearing first, which is 4.005. If an inaccuracy occurs he will still be on the safe side as he has two thousandths of an inch to go before the piece is spoiled.. The opposite applies to the bore, which is specified 4.000, 4.002, starting with the lower dimension. If aiming for 4.000 he would still be permitted to err within two thousandths before the piece is rejected. The nominal diameters shown in the tables are selected from the "Fractional Preferred Numbers" recently approved by the American Standards Committee.

DEFINITIONS

BASIC DIMENSION is the theoretical or nominal standard size from which all variations are made. The basic dimensions will include the allowance for fits.

LIMITS OR LIMITING DIMENSIONS are the specified maximum and minimum dimensions permissible for any basic dimension.

TOLERANCE is the prescribed differ-

ence between the limiting dimension prescribed for any basic dimension,

ALLOWANCE is the prescribed difference between the dimensions of mating parts to provide for various classes of This may be further divided into:

Nominal Allowance, which is the dif-ference between the basic dimensions of the two mating parts;

Minimum Allowance, which is the smallest allowance permitted by any combination of the limiting dimensions of two mating parts;

Maximum Allowance, which is the greatest allowance permitted by any combination of the limiting dimensions of the two mating parts.

EXAMPLE

A shaft is to be pressed into a spider. The dimension should be specified as follows:

Diameter of shaft 4.253

4.253

Bore of spider 41/4

4.250

4.251

Basic dimension of shaft is 4.253 Basic dimension of spider is 41/4 Limiting dim. of shaft are 4.253 and 4.2525

Limiting dim. of spider bore are 4.25 and 4.251

Tolerance of shaft is 4.253-4.2525= .0005

Tolerance of spider bore is 4.251-4.250 = .001

Nominal allowance is 4.253-41/4 = .003 Maximum allowance is 4.253-4.250=

Minimum allowance is 4.2525-4.251= .0015

TABLE 1 LOOSE FIT

	Nominal Diameter				Turn			ore (Clearance		
	Nonini	lai	Diameter	-	Max.	Min.	Min.	Max.	Min.	Max.	
Above	.125	to	.250	11	0	002	+.002	+.007	.002	.009	
54	.250	66	.300	11	0	002	+.004	+.011	.004	.013	
**	.300	66	1.000	- 11	0		+.006	+.016	.006	.019	
6.6	1.000	66	2.500	- 11	0	004	+.008	+.016	.008	.020	
68	2.500	46	4	11	0	005	1 +.008	+.016	.008	.021	

Pin or Equivalent: Based on C.R.S. stock, adaptable for automatic screw machine production. To be specified on drawing to the nearest number, letter or fractional drill Hole: Not reamed. that will result in a hole which will come within the specified tolerances.

mple Designation: (For ¼ in. diameter loose fit) = .257 drill.

mple Application: Hinge Pin.

Example Designation: Example Application:

mension

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.2525 = 4.251 - 4.251 - 4 = .003 4.250 =

1.251=

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TABLE 2
WORKING FIT—INTERMITTENT MOTION

	Nomin	al	Diameter	11	T	urn		В	ore		Clearance		
	Homin	041	D rainio sci	-	Max.	Min.	11	Min.	Max.	-11-	Min.	Max.	
Above	.125	to	.300	- 11	0	002	11	+.001	+.003	11	.001	.005	
66	.300	84	1.000	- 11	0	003	11	+.001	+.005	11	.001	.008	
- 11	1.000	66	2.500	- 11	0	004	II	+.001	+.005	11	.001	.009	
11	2.500	66	4.000	- 11	0	l005	T	+.001	1 +.005	11	.001	.010	

Pin or Equivalent: Based on C.R.S. stock, adaptable for automatic screw machine production. When other materials are used it may be necessary to grind pins on centerless grinder. Hole: Special reamers or 4 lip drills.

Example Application: Motor operated mechanisms.

TABLE 3
SLIDING FIT

	Nominal I	al Diameter		Turn				Bore				Clearance			
reominal Diameter	11-	Max.	Min.	11-	Min.	Max.	- -	Min.	-	Max.					
Above	20 to	40	11 -	003	006	11	0	+.003	11	.003	1	.009			
14	40 to	64	11 -	006	010	11	0	+.004	11	.006	1	.014			
11	64 to	100	11 -	010	015	11	0	004	11	.010	T	.019			
44	100		11 -	015	020	11	0	+.005	11	.015	1	.025			

Rocker Ring or Equivalent: Turned.

Hole: Bored.

Example Application: Brush Rigging Device on Generator Frames.

TABLE 4
RUNNING FIT—LOW SPEEDS

	Nominal Diameter	Turn	Bore	Clears	ince
	Nominal Diameter	Max. Min.	Min. Max.	Min.	Max.
Above	.125 to .300	001 002	0005 +.0005	.0005	.0025
44	.300 "750	0015 003	0005 +.001	.001	.004
66	.750 " 1.250	002 004	0005 +.0015	.0015	.0055
- 11	1.250 " 2.000	0025 0045	0005 +.0015	.002	.006
- 66	2.000 " 4.000	003 003	0005 +.0015	.0025	.0065

Pin or Equivalent: Grind on centerless grinder or equivalent. Hole: Standard Reamers.

Example Application: Manually operated mechanisms.

TABLE 5 SNUG FIT

	84		inal	Diameter	Tu	rn	В	ore	Clearance		
	Homman Diameter		Max.	Min.	Min.	Max.	Min.	Max.			
Above	2	to	4		0005	001	0	+.001	.0005	.002	
"	4	4.6	6		0005	0015	0	+.0015	.0005	.003	
44	6	66	10		001	002 il	0	+.002	.001	.004	
6.6	10	66	16		001	003	0	+.002	.001	.005	
11	16	66	25		002	004	0	+.003	.002	.007	
	25	66	40		002	005	- 0	+.003	.002	,008	
66	40	66	64		002	005	0	+.004	.002	.009	
- 61	64				.003	006	0	+.004	.003	.010	

Shaft or Equivalent: Turned.

Hole: Bored.

Example Application: Bearings and Vertical Bearing Brackets.

TABLE 6 CLOSE FIT

	Nomi	nal	Diameter	- 11	Turn		В	ore	Clearance	
		11-	Max.	Min.	Min.	Max.	Min.	Max.		
Above	.125	to	.300	- 11	0	0005	0	+.0003	0	.0008
66	.300	6.6	.750	11	0	0005	0	+.0005	0	.001
**	.750	44	1.250	li	0	001	0	+.0005	0	.0015
4.6	1.250	66	2.000	11	0	001	0	+.0008	0	.0018
44	2.000	41	4.000	- 11	0	001	0	+.001	0	.002

Pin or Equivalent: Turn from nearest larger stock size and grind on centerless grinder or equivalent.

Hole: Use selected reamers.

Example Application: Lock Pins.

TABLE 7 CLOSE FIT

	Nominal Diameter				-	T	urn	B	lore	Clearance		
		-	Max.	Min.	Min.	Max.	Min.	Max.				
Above	2	to	4		11	0	001	0	+.001	0	.002	
66	4	66	6		- 11	0	001	0	+.0015	0	.0025	
44	6	46	12		11	0	1001	0	+.002	0	.003	
66	12	**	25		11	0	002	0	+.002	0	.004	
4.6	25	46	50		- 11	0	002	0	+.003	0	.005	
44	50				11	0	003	0	+.004	0	.007	

Shaft or Equivalent: Turned. Hole: Bored.

Example Application: Self-Aligning Bearing and Horizontal Bracket or Pedestal.

TABLE 11 HEAVY PRESS FIT-(USED ALSO AS LIGHT SHRINK FIT)

	Nom	inal	Diameter		Tu	rn	B	lore	Interf	егепсе
					Max.	Min.	Min.	Max.	Min.	Max.
Above	1 1/2	to	2	11 -	002	+.0015	0	+.0007	.0008	.002
44	2	66	2 1/2	11 -	0025	+.002	0	+.001	.001	.0028
£6	2 1/4	66	3 1/4	11 -	0035	+.003	0	+.0015	.0015	.003
66	31/4	44	4	11 -	004	+.0035	0	+.0015	.002	.004
46	4	66	5	11 -	0045	+.004	0	+.0015	.0025	.004
66	5	64	6	11 -	005	+.0045	0	+.0015	.003	.005
66	6	46	8 '	11 -	0055	+.055	0	+.0015	.0035	.005
44	8	81	10	11 -	006	+.0055	0	+.0015	.004	.006
**	10	41	12	11 -	007	+.006	0	+.0015	.0045	.007
16	12	66	16	11 -	008	+.007	0	+.0015	.0055	.008
44	16	84	20	11 -	009	+.008	0	+.002	.006	.009
4.6	20	66	25	11 -	010	+.009	0	+.002	.007	.010
41	25	**	32	11 -	011	+.010	0	+.002	.008	.011
64	32	64	40	11 -	012	+.011	0	1 +.002	.009	.012

Shaft or Equivalent: Plus allowance. Turned or ground on centers.

Hole: Bored.

Example Application: Steel couplings for heavy duty, such as steel mill drives, Diesel engines, elevator rope sheaves, solid steel hubs, etc.

STEEL BARREL AND DRUM RIM ROLLERS

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The three widely diversified finished products mentioned above have one point in common. They were produced with the aid of our tool steels cast to shape. This emphasizes again the point which we continually stress—no matter what the industry or how diverse and exacting its requirements, one of our specialized tool steels can meet them with the utmost efficiency and economy.

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satral District Sales Manager: William C. Eak 707 Bertahim Am., Pittsburgh, Peessulvania

NOR

TABLE 8 BUMPING FIT-STANDARD

	BI o		al Diameter	1	Tu	rn	8	ore ·	Interference		
	140	1111111	ai Diameter	11-	Max.	Min.	Min.	Max.	Min.	Max.	
Above	1	to	5	11	+.001	+.0005	0	1 +.0005	0	.001	
- 66	5	64	10	- 11	+.0015	+.001	0	+.001	0	.001	
**	10	44	20	- 11	+.002	+.0015	0	+.001	.0005	.002	
**	20			11	+.003	+.0025	0	+.001	.0015	.003	

Shaft or Equivalent: Plus allowance. Turned or ground on centers.

Up to 5 in. diameter holes are based on selected reamers, except coupling recess.

Above 5 in. diameter holes are bored.

Example Application: All applications, where the hub may have to be dismounted without having a hydraulic press available. Coupling pilot and recess.

TABLE 9

					BUI	MPING	FIT—SI	PECIAL				
				Diameter	Turn			Bo	re	interference		
	14	опп	11411	Diameter	11-	Max.	Min.	Min.	Max.	Min.	Max.	
Above	1/4	to	1		11	0	0005	001	0005	0	.001	
- 11	1	46	2		- 11	0	001	0017	001	0	.0017	
. 64	2	64	4		11	0	001	002	001	0	.002	
44	4	44	8		11	0	001	0025	001	0	.0025	

Shaft or Equivalent: Minus tolerance as used for shaft extension. Turned or ground on centers. Hole: Coupling or Pinion, special reamer up to 1 in. diameter hole. Bored above 1 in. diameter

eter hole.

Example Application: Couplings, Pinions, Pulleys for general purpose—Industrial Motors, where

TABLE 10 LIGHT PRESS FIT

Nominal Diameter	Turn	Bore	Interference
Nominal Diameter	Max. Min.	Min. Max.	Min. Max.
Up to 1/2	+.0005 +.0003	0 +.0002	.0001 .0005
Above ½ to 1%	+.001 +.0007	0 +.0005	.0002 .001
" 1% " 2%	+.0015 +.001	0 +.0005	.0005 .0015
" 2 % " 4	+.0025 +.002	0 +.001	.001 .0028
" 4 " 5 1/2	+.003 +.0025	0 +.001	.0015 .003
" 5½ " 7	+.0035 +.003	0 +.0015	.0015 .003
" 7 " 9	+.004 +.0035	0 +.0015	.002 .004
" 9 " 12	+.0045 +.0035	0 +.0015	.002 .004
" 12 " 16	+.005 +.004	0 +.0015	.0025 .005
" 16 " 20	+.0055 +.0045	0 +.002	.0025 .005
" 20 " 25	+.006 +.005	0 +.002	.003 .006
" 25 " 32	+.007 +.006	0 +.002	.004 .007
" 32 " 40	+.008 +.007	0 +.002	.005 .008

Shaft or Equivalent: Plus allowance. Turned or ground on centers.

Hole: Up to 2 % in diameter holes are based on selected reamers. holes are bored. Above 2 % in. diameter

nple Application: Cast iron couplings, steel couplings for general industrial applications, gears and pinions (heavy duty), cast iron hubs, split hubs. Example Application:

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WHERE NO OTHER BEARING WILL



PARALLEL LINE CONTACT

folid cylindrical rolliers between cylindrical roon providing maximum load contact area, horozod steedy load capacity, and a larger shat-shoroling capacity than any other type of single-row bearing.

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Picture to yourself the most difficult load conditions a hearing can be called upon to meet—high speed, heavy load, temporary overloads, shock, vibration. Then read, in the adjoing column, how NORMA-HOFFMANN Precision Roller Bearings—time-tested heavy-duty units—meet these conditions.

And remember—PRECISION Roller Bearings interchange in size with all standard ball bearings. They can be had—in addition to the standard type here illustrated—in one-lip, two-lip (self-contained), full roller type (without cage), self-aligning and adapter types.



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PRECISION BEARINGS

BALL, RVLLER AND THRUST

MOMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.

TABLE 12 SHRINK FIT—(STEEL ONLY)

	Maminal		Diameter	Turn		Bore		Interference	
Nominal Diameter		Diameter	Max.	Min.	Min.	Max.	Min.	Max	
Above	1 1/2	to	2	+.002	+.0015	0	+.0007	.0008	.002
44	2	44	2 1/2	+.0025	+.002	0	+.001	.001	.00:
46	2 1/2	44	3 1/4	+.0035	+.003	0	+.0015	.0015	.00
66	3 1/4	66	4	+.004	+.0035	0	+.0015	.002	.00
44	4	66	5	+.0045	+.004	0	+.0015	.0025	.00
**	5	**	6	+.005	+.0045	0	+.0015	.003	.00
44	6	66	8	+.006	+.005	0	+.0015	.0035	.00
11	8	66	10	+.007	+.006	0	+.002	.004	.00
44	10	66	12	+.008	+.007	0	+.002	.005	.00
66	12	66	14	+.010	+.009	0	+.002	.007	.01
44	14	66	16	+.012	+.010	0	+.002	.008	.01
**	16	44	18	+.014	+.012	0	+.003	.009	.01
"	18	4.6	20	+.016	+.014	0	+.003	.011	.01
**	20	66	22	+.018	+.016	0	+.003	.013	.01
16	22	66	25	+.020	+.018	0	+.003	.015	.02
64	25	66	28	+.022	+.020	0	+.003	.017	.02
**	28	44	32	+.024	+.022	0	+.003	.019	.02
44	32	6.6	36	+.027	+.024	0	+.003	.021	.02
44	36	6.6	40	+.030	+.027	0	+.003	.024	.030

Shaft or Equivalent: Plus allowance. Turned or ground on centers.

Example Application: Fly wheels, shrink rings.

National Metal Trades Association Sponsors Machine Shop Course

The National Metal Trades Association has announced the publication of "Machine Shop Technology"—a unit course of instruction for students and apprentices engaged in acquiring knowledge and skill in the machinist and toolmaker trades.

The course was developed by the association's Committee on Industrial Education, assisted by more than one hundred practical shop men and a group of well-known trade school instructors. The course is suitable for use in company training programs or in public schools offering practical or related instruction in these trades.

The group comprises 226 lesson units, amounting to more than 1,000 pages with more than 600 illustrations. It is divided into six sections, as follows: Part I, Hand Tools, Measuring and Recording Instruments. Part II, The Engine Lathe. Part III, The Milling Machine. Part IV, The Cylindrical Grinding Machine. Part V, The Shaper. Part VI, The Turret Lathe.

The scope of the work may be realized when it is known that the section dealing with the engine lathe and its functions includes 72 separate lessons; 21 is sons dealing with the design, operating and function of the various parts of the lathe; 29 lessons dealing with the various kinds and types of operations the are and can be performed in the lather and 22 lessons each of which gives the student an actual task to perform. It is the time the student has completed the series of lessons there will be nothing about the engine lathe with which he not familiar—and the same may be sightly the other five parts of the course.

The course is available to the publication of the course is available to the publication of the course of the cour

The material is available through All Pierce, Director, Department of Industria Relations, National Metal Trades Association, Peoples Gas Bidg., Chicago, Ill.

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By mentioning MODERN MACHING SHOP when writing to the firms address tising in this magazine, you are helps to build up a bigger and better magazine for your own benefit. Cooperation page

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ROGRESS is the fruit of engineering. To the engineer-mechanical, electrical, or chemical-can be credited the development of the materials and mechanisms that form the basis of our modern civilization. Consequently the engineer, more than anyone else, is able to appreciate the scientific exhibits at the "Century of Progress" Exhibition now open to the public at Chicago.

The engineer who visits the Exposition will be in his glory in the Hall of Science. He will find that the builders of the fair have reached into far and strange places to gather materials for this unique and inspiring exposition. They have stretched their hands back 10,000 years into the dim past. They have made visual the dark depths of the sea, and have mingled the products of the arctics with those of the equator.

He will see smiling scientists conjuring with various kinds of invisible waves and rays, and performing seeming miracles with sound and light. Machines that seem to think are made to perform astounding varieties of magic. It is a rather staggering series of exhibits, taken as a whole, but when analyzed one by one the picture becomes orderly and quite understandable.

The "Century Progress

Is Best Appreciated By The Engineer

One single display is the result of soun collaboration by forty universitie are: laboratories, governments and control companies. This is the exhibit of the and is 92 elements which go to make we have, the world and all that's in it. As cular ranged in groups and labeled as hed d names and numbers, it comprises tures fascinating feature.

Those who are more scientifically work, minded will be interested in the velop "hodoscope." This is an instrument sects, recently invented, which makes vis lapse, ble the cosmic ray and enables the motio observer to count the rays as the obserstrike. Among other recent discordiffe, leries of science on display are heavy and in hydrogen and heavy water, hailed by ture a scientists a few months ago as ven gans, important finds.

Universities, laboratories, museums and so hospitals, scientific organizations groups, and industries have cooperat proces ed to tell in graphic manner a large variety of amazing scientific facts Use is made of motion and sound pictures, mechanics, art diaramas models, chemicals—every conceivable thing that can be used for visual story demonstration.

Physics is given special attention everythe Molecular physics are pictured as the have to do with gases, liquids, and solids; electrostatics, magnetism, in

duction; the generator, transformer, vacuum tubes, radio, light, color, and energy.

Mathematics, which is involved in every realm of science, has a large place in the Hall of Science. Every effort is made to illustrate with utmost clarity such mysteries as link motion, the workings of the slide rule, the Barnett gyromagnetic effect, the Galton quincunx, the computation of pi, the fourth dimension, Einstein's theory of relativity, and other puzzlers to the "average" mind. Days could be spent in the Science Motion Picture Theatre alone. Just a few of the motion pictures, with

ersitie are: d com Chemistry and Physics—Oxidation of the and reduction of ores; the blast furake m nace, and thermite welding; the molet. Ar cular theory of matter, with animatas to ed drawings and micrographic pic-rises: tures.

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Biology-Plant growth, flowers at fically work, seed dispersal, the physical dein the velopment of birds, bugs, beetles, inument sects, and animals, shown with times visi lapse, micro-photographic, and stop-les the motion pictures. Biology carries the s the observer through the varied story of discordife, beginning with the single cell hear and including embryology, the structure and function of the human orser gans, the distribution of living creations were gans, the distribution of living creating the structure of the structure of

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seums and so on. ation Geology—The ceaseless perat procession of building up large facts earth's crust. Geology soun prings the story of the ramas formation and development of the world. visua story starts a billion years ago and includes ention everything from tiny s the lorses to giant pigs—both ong extinct.

Medicine-Man against

microbes; the dramatic fight against disease germs. Man's never-ending battle with microbes and other destroyers; the discovery of the value of anaesthetics and sterilizing agents, and his wonderful work in perfecting surgery are vividly pictured.

Astronomy-A motion picture journey to the moon, sunrise and sunset in lunar craters; a solar eclipse portrayed by actual pictures.

The Electrical Building is also of especial interest to the manufacturing executive. In this exhibit is a model factory building containing electrically-operated equipment and demonstrating various applications of electric heat. The equipment in this model plant includes a minute heat treating furnace equipped for magnetic control of temperatures, an indirect arc type melting furnace, and other examples of modern equipment.

The reader-audience of MODERN MACHINE SHOP forms probably the largest single group of men who are able to appreciate to the fullest extent the educational value of the exhibits in these buildings, and it is for this reason that these interesting exhibits are brought again to the attention of our readers, together with the recommendation that everyone who possibly can should see them. For many of us, the opportunity will

not come again.



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NEW

₹ IDEAS FROM READERS ₹

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for

Machining Pump Impellers in the Shaper

BY AVERY E. GRANVILLE

A N UNUSUAL shaper set-up for machining pump impellers is shown in the illustration. The fixture

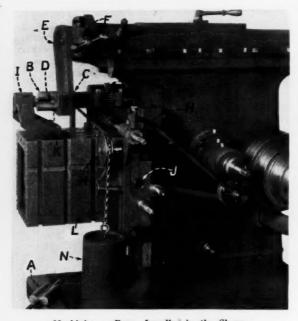
roughing cut has been taken.

The impeller is made in one piece from a steel casting or forging. After the ends have been centered, the shaft ends are turned and faced in a lather the keyways are cut in the shaft, and the body is roughed approximately to form in a milling machine. The piece

is then placed in the fixture shown set up on the shaper and is finished to size and shape. A little scraping or hand-work with abrasive cloth is sometimes needed in the final fitting and assembling to insure a close fit and smooth operation.

A finished impeller is shown at A and another can be seen in position in the machine at B. A master form, keyed to the impeller shaft, is visible at C. As the shaper ram reciprocates, the mechanism H operates worm and wheel G, thus revolving the work-spindle and with it the master form C. The arm E, which is bolted to the toolslide F on the shaper

ram, carries a ball-shaped roller and the disc-shaped cutting tool D, the tool being held in a small clapper box as shown. The ballshaped roller is in contact with the master form; thus as the work-piece



Machining a Pump Impeller in the Shaper

is so designed that, after the job has been set up and the machine started, the operation is practically automatic. The only adjustment required is the re-setting of the cutting tool for the finishing cut after the st, 1934

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One of the greatest unofficial testers of small tools is the piece-worker. His pay envelope is a reliable indicator of how well the cutting tool is standing up — how rapidly and economically it is performing.

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revolves, the roller governs the movement of the tool. As can be seen, the toolslide F is set cross-wise so that it can be used to feed the tool in and The outer end of the workspindle is supported by a bracket and bearing at I.

To provide for free movement of the table in order to keep the guide roller and master form in contact, the screw for the table cross-feed has been removed as shown at J. A steel

bar K is bolted to the shaper table and the chain L is attached to it. chain runs over the grooved roller M and supports the weight N, which exerts the necessary tension to keep the master form and guide roller in contact as the machine operates.

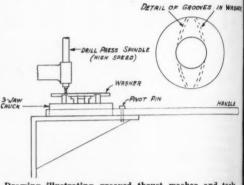
Cutting Oil Grooves in Brass Washers

By F. L. PYLE

WE MAKE a great many brass thrust washers, of a type that has oil grooves cut in both sides. tools used in cutting the oil grooves are of simple design, and may be interesting to the other readers of your magazine.

The washer is held for grooving in a three-jaw chuck that is located on the table of a small high speed drill press. To the chuck is attached a handle which is pinned to the machine table by a pivot pin, as shown in the illustration. As the chuck is free to slide on the table, it can be moved back and forth by means of the handle. The cutting tool is a short twist drill, ground slightly flat at the cutting edges and round at the nose, so that it will make a round-bottom channel for conveying the oil.

The washer is held in the chuck and the stop on the drill spindle is set so that the drill will cut a groove of the correct depth. With the drill cutting at full depth, the handle is moved so as to feed the washer across under the drill with a circular motion, cut. ting a slightly curved groove a shown in the illustration. It is our opinion that the curved groove is better than a straight one for the distribution of lubricant. When one side



Drawing illustrating grooved thrust washer and took

of the washer is grooved, it is turned over and the other side is grooved

The drill should be run at very high speed: thus a smooth groove is produced, and the operation is quickly completed.

Adjustable Radius - Turning Tool for the Lathe

BY HALVOR ANDERSON

THE drawing shows the design of an unusually interesting radiusturning tool for the lathe, and the photographs show the use of the tool and some of the work that has been done with it. The radius is cut with a single point tool, the toolbit being

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We are not trying to be spectacular—13,050 holes from a tap without once removing the tap from the machine even for grinding may not be a record . . BUT this manufacturer previously secured only 200-300 holes per life of tap before Bath got on the job. The Bath tap cost more than the other tap previously used—it probably cost twice as much but it did more than 40 times as much work)—it was a Special Bath tap—it cut cleaner threads—and at the present writing, it is STILL CUTTING GOOD CLEAN THREADS.

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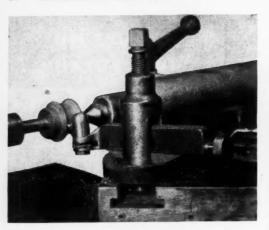


Fig. 1—Adjustable Radius-Turning Tool in position for turning a small spool-pulley.

held in a revolving head that is controlled by means of a crank han- the operator, the power thus applied

dle at the rear end of the holder. Radii from % in. to 1% in. can be turned with this tool, the setting for the desired radius being obtained by measuring with a micrometer from the tip of the tool to the opposite side of the head and then subtracting half the diameter of the head, in the usual manner.

The shank of the tool, or holder, is $\frac{1}{2} \times 1_{16}^{1}$ in $\times 6\frac{1}{4}$ in. long, as shown in the drawing. The revolving head is offset from the holder so that teeth cut in the head can mesh with a worm-thread on the end of a shaft that extends through the holder.

When the crank handle is turned by

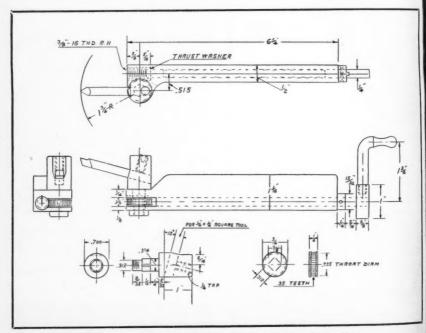


Fig. 2-Drawing of Adjustable Radius Turning Lathe Tool

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- STAINLESS STEEL. All gears, pinions, screws and racks made from this material which is non-corrosive and on account of its extreme toughness will wear much longer than brass. Federal indicators are entirely rust proof throughout.
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is transmitted through the shaft to the revolving head, swinging the point

of the tool as required.

The holder is of cold drawn steel, cyanided, and the head is of tool steel. The shaft is also of soft steel, so that if undue tension is somehow brought to bear on the tool and strain is placed on the gears, the thread on the shaft will give and the



Fig. 3—(Above) Adjustable Radius-Turning Tool with Crank Handle Removed. (Below) Ball Race Made with This Tool.

teeth on the head will be saved. The slot in the head is made for a 1/4-in. square toolbit.

The illustration Fig. 3 shows the tool with the handle detached and also shows a finished ball-race that was cut with the tool.

Making Ball Clutches on a Drilling Machine

BY PAUL A. BARD

MAKING the plates, or disks, for holding the balls in small ball-clutches isn't hard when a device similar to the one shown is used. Ours is not precision machinery and we do not have to make parts in large lots, so many of our jigs and fixtures

might seem rather crude to some. However, they help us "get by" at a profit while others who put too much time and money into expensive took frequently do not.

Every mechanic is familiar with some form of ball clutch, where one or more steel balls are used in sloping slots so that when the clutch is

engaged, the balls press against an opposing plate which is driven when the drive shaft and ball disk move in one direction and released when the drive shaft is stopped or runs in the opposite direction. In our case

we use a three-inch disk carrying eight 14-in. steel balls. The sloping slots in which these balls work are made with a 9/32-in. drill, ground rounding on the end. The cutting edges are ground as for brass work: that is, straight across and parallel with the axis of the drill. The deep end of each slot is made 5/16-in. deep and slopes up to nothing on the other end which runs close to the deep end of This gives the balls the next slot. a sharp enough slope, or rise, so that they grip well but have no tendency to wedge when the shaft is reversed or stopped. When a quick release is desired, this wedging tendency always has to be allowed for in a clutch of this kind.

The ball-holding disk of the clutch to be slotted is placed in the fixture as shown at A, and is held on the fixture-spindle by a screw-on locking ring and a key which fits a keyway cut in the disk. The master guiding ring, B, has eight sloping steps, or rises, corresponding in slope and spacing to the slots that are to be cut in the ball-disk of the clutch. Four convenient wooden handles C make it easy for the operator to turn the master ring and work, as he works the drill spindle lever. A heavy steel rol

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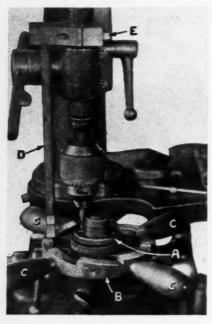
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D, set into a steel bracket E, is clamped to the drill spindle sleeve as shown. The lower end of this guide rod contacts the rises of the master ring and



Ball-clutch Milling Fixture for a Drill Press

thereby governs the depth to which the drill cuts into the ball-disk in the fixture.

In roughing out the sloping slots, the operator uses the shortest drill he can so as to avoid all the spring possible, and he proceeds to work the drill straight up and down as he gradually turns the master ring and works by means of the wooden handles. This not only automatically spaces the slots, but governs the entire depth from the deep end to the "vanishing point" at the top of the slope. This method of working the spindle of the drilling machine up and down avoids springing the guiding rod and the drill

itself under the heavy pressure of the roughing cuts.

When well roughed out all around the slots are smoothed out by speed. ing up the drill and steadily turning the work. Final finishing is done by putting a round stick of Carborundum in the chuck and running the drill spindle at the highest speed possible working the master guide around in steady movements on each slot in turn. The end of the Carborundum stick is. of course, first rounded to the exact shape of the finished slots, so as to give a smooth, well rounded set of slots for the balls to work in nicely.

Jig for Drilling Peripheral Holes

BY CHARLES KUGLER

THE drill jig shown in the illustration was designed by the writer for use in drilling holes in washers for holding roller bearings. The principal feature of the jig is that the bushing plate can be adjusted to permit the drilling of work of varying thicknesses, and, by using bushings of different lengths, of different diameters. As can be seen by reference to the drawing, the jig was constructed largely by the welding process.

The jig consists primarily of the base A, to which is attached the supporting plate B which, in turn, carries the shaft G and the index plate E, and also the bushing plate K.

The foundation of the jig is the base A, which rests on four hardened steel feet. Rising from the base is the supporting plate B, through the center of which extends the shaft G. The shaft carries the index plate, E, at the rear end, and the front end is conditioned to provide for quickly attaching the work-piece. To prevent of the

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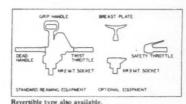
The E-6-C Reamer Non-Reversible



Free	Reaming	SPECIFICATIONS		Spindle
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300	11	26	15	2 1
200	11	26	15	2/4

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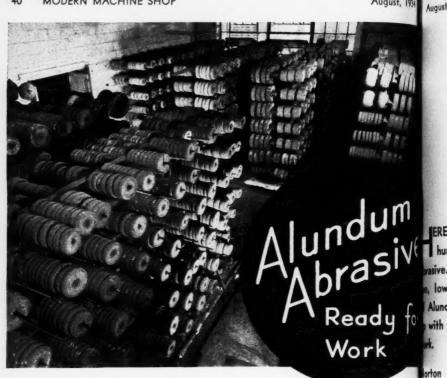
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NORTON PRODUCTS: Grinding Machines; Lapping Machines. Abraing William and Tubes. Non-slip Tiles, Treads and Aggregates. Behr-Maire Pa

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IERE'S a dry room with hundreds of polishing wheelshundreds of polishing wheels set up with Alundum vasive. It's in the plant of The Maytag Company, Newlowa, large manufacturers of washing machines—users Alundum abrasive because they've found that wheels set with it are really ready for work-lots of work and good

Porton sizing methods assure abrasive of exceptional uniprmity—no too coarse grains to scratch and mar the finish; to too fine grains that fail to do their share of the work.

pecial surface treatments assure abrasive of extremely high apillarity—grains that the glue can grip firmly, haking strong wheel heads.

nd Norton packing methods assure Alundum brasive's reaching the customer with its high apillarity unimpaired.



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Abrang Wheels, Pulpstones. Laboratory Ware: Refractories; Porchardine Papers and Cloths. Norton Pike Sharpening Specialties. Laboratory Ware: Refractories; Porous Plates 42

the work from rotating under pressure of the drill, the supporting plate B is slotted and the shaft is locked by means of the locking screw H. The plate B also carries the block D,

carries a scale that enables the bush. ing to be set at a given distance from the edge of the work, or to be adjusted so as to bring the hole in the center of the work. As designed, the

0 B G

Design of Jig for Drilling Peripheral Holes

the center of which is in line with the center of the shaft G, and which is made to extend over the edge of the index plate E so that the plunger F can slip into position in the holes in the index plate.

To the top of the supporting plate B is attached the bushing plate K, carrying the bushing. The bushing plate slides in a square slot cut in the top of the supporting plate, so that it can be adjusted according to the widths of different sizes or thicknesses of work-pieces. The bushing plate

shaft G was turn. ed on the end to fit the hole in the smallest piece of work for which the jig would be used, and split bushings Were provided to make the shaft fit larger holes. A spring jack J can be used to support the work so that the pressure exerted by the machine spindle will not be

brought to bear on the shaft G. A jig of this design, with variations, can be used for a wide variety of work

Simple Method of Graduating

By F. B. HELANDER

BEING confronted recently with the problem of graduating a number of cast iron compounds which

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Automatic [Fast Accurate Wittek Feeds are designed for high-speed feeding of any stock from coils. Can be mounted on the right, left, front or back or in tandem as a push-pull feed. Will feed from 0" to 30" or more per stroke of the press. Built with or without straighteners to meet press. Built with or all feeding conditions.

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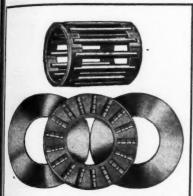
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TIME STUDY NEWS

In these days of fixed wages and working hours, there is one outstanding industrial problem of paramount importance — Output Per Man. The trends of manufacture and competition demand a full knowledge of all productive and non-productive operations on the part of all those responsible. This knowledge can be obtained from the observance of modern time study procedure.

TO MANAGERS AND SUPERIN-TENDENTS: You can be thoroughly trained in modern time study practise for personal use in directing time study men and others under your control. Costs cannot be lowered or controlled at the minimum level by yesterday's conception of time measurement principles. Or, you may be interested in our group study plan for industries sponsoring classes for their

TO THE TIME STUDY MAN: Regardless of your ability, we are confident we can help you broaden your training to meet new issues imposed by these industrial recovery days. Time Study work is a vast subject and you cannot know too much about it. Our course of training will unques-

tionably help you. TO OTHERS: Engineers must supplement their training with an exact knowledge of time study work. Foremen find our training of inestimable value in making proper analysis of their work. Many others are finding our course the means by which new, high salaried positions are opened to them.

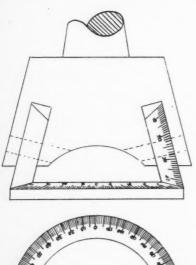
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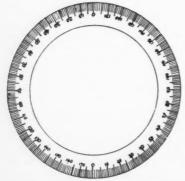
NATIONAL SCHOOL OF TIME STUDY

Box 366B, Norwalk, Connecticut.

were so constructed that it was impossible to mark the graduations with a flat die in a press, we finally decided to graduate them by the rolling method.

A fixture was designed as shown





Design of drill press tool for graduating work.

to fit the spindle of a drill press. The head contained two rolls, set at the same distance from the center, one of the rolls being graduated as shown and the other blank. By applying leverage to the spindle, the graduated roll was forced down heavily enough to reproduce the graduations in the work, and the

blank roll evened the flare so that a neat appearing job was obtained accurately and quickly.

Cutting Threads on Fibre

A SOLUTION to one of the problems which has puzzled many turret lathe operators is given by C. S. Stilwell, sales manager, the Warner & Swasey Co., machine tool and precision instrument builders, Cleveland.

One of the company's demonstrators was doing some work in the machine shop of a nationally known concern and found that the best operators had been unable to cut a clean thread or some fibre material. A die head was used but the thread would break or chip, and the job would not pass inspection. Other operators tried the job. Chases were reground and a variety of lubricants were tried.

The solution came when one inquiring operator found that the fibre miterial was stored in the stockroom way up by the ceiling and became, as a result, very dry. By putting the material out of doors overnight to that it would gather moisture, it was found that perfect threads could be cut. The overnight seasoning did the trick.

the Landis Tool Company, Waynesom Pa., and describing the Landis Type B Hydraulic Roll Grinding Machines, In now available. The booklet contains twelve pages of description of the Landis 16-in., 20-in., 24-in. and 28-in. aiza especially designed for the grinding of the smaller diameters of rolls. The machine is fitted to grind roll bodis either straight, concave, or convex, and is especially recommended to the strip metal industry where the 20-in. machine would be the one generally required.

A copy of the catalog will be sent to any mechanical executive upon request

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Over the Editor's Desk

The Engineer

N another page of this magazine is an article calling attention to the amazing array of exhibits to be found in the Hall of Science at the "Century of Progress", and recommending that every one of our readers who can do so should see it. The article is seemingly addressed to "engineers", consequently the question arises as to just what we mean by engineers, and why we think that the engineer is so important to humanity.

Webster says that an engineer is "one who carries through an enterprise by artful contrivances." The inference is that the person who is carrying through the enterprise must be capable; by what process he has acquired the knowledge that makes him capable is beside the point. Whether he has acquired his academic training first and his experience afterward or the other way around is immaterial. Some of the best engineers today are men who obtained at least a part of their experience first and their "book learning" afterwardusually by burning the midnight oil.

Pioneers in the art of working metals attained their results, not by virtue of scientific knowledge, but by hard experience. The engineer's skill was built on a foundation of results, not of causes. The modern engineer, on the other hand, lays his plans according to his knowledge of causes and thus obtains the results he seeks. He is not satisfied with results; he must know what the causes are so that the results can be controlled as he wishes.

To the engineer can be credited the tools by which the normal span of life has been extended and made more liveable. In putting electricity to

work the engineer has tapped the versource of life itself and has harnessed the energy by which the miverse is heated, lighted, and controlled. The engineer has devised too by which we can accomplish other wise impossible tasks. Modern machines have enabled us to conquer the air, the sea, and the elements.

Household and industrial tasks the formerly were performed by dint of hard labor and unsanitary method have been rendered easy and clean due to the development of machiner. The average life of human beings have been extended from the 45 years of half a century ago to the 58 years of today—to a certain extent through the efforts of the engineer.

It would seem that the engineer he reached the point where he require only to know what the world need and he will produce it. But now that he has reached that point, he is confronted with another task; one which may not be so easy.

Within a span of some forty year the world has been given more time and labor saving tools than it had ever had before all put together, but it has failed to realize their possibilities The engineer must now become the salesman. He has given the work the opportunity for a better civilization; a higher plane of living; more time for physical and mental development. With the proper management all of these things are possible, but it now seems that the engineer wil also have to show the world how to use these advantages. Having presented the world with scientific servants, he is now confronted with the task of showing the world how to control them so as to obtain the fullest possible benefit.

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NEW SHOP EQUIPMENT

Norton 16-In. Type C Cylindrical Grinding Machine

A 16-in. Type C cylindrical grinding machine has been announced by Norton Company, Worcester, Massachusetts. In general design it is quite similar to the 10-in. Type C line announced last December, although considerably larger and

heavier in every detail.

It is offered as a motor driven machine only, the grinding wheel spindle being driven by an individual motor mounted directly on the wheel-slide. Likewise, the headstock is driven from an adjustable speed direct current motor mounted on the unit while a third motor drives the pumps and table traversing mechanisms

The machine will swing 161/2 inches over the table and mounts either a 30 in. or 36 in. diameter grinding wheel. It is built in lengths of 36, 48, 72, 96, 120, 144, 168 and 192 inches, and is offered either with hydraulic table traverse or mechanical traverse. If desired it can also be supplied as a hand traverse machine. The headstock weighs approximately 950 pounds, has better than a 19 in. long bearing on the table and mounts a 1% in. diameter center. The footstock weighs over 200 pounds, has a 1434 in. length bearing on the table and also mounts a 134 in. diameter center.

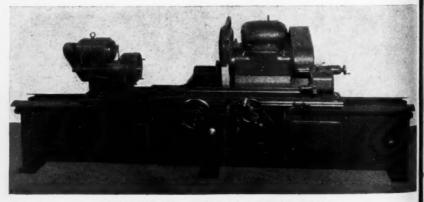
One of the particular features of the machine is the grinding wheel unit,

which weighs nearly 3400 pounds complete. The grinding wheel spindle is made of heat treated alloy steel and is over 42 inches long. The large bearing is 41/4 inches in diameter x 101/8 inches long while the small bearing is 37/8 inches diameter x 81/2 inches long. Both bearings are flood lubricated, the oil passing through a filter just before it enters the bearings. Three spindle sheaves are funished as standard equipment, the made as easily as changing grinding wheels. V belts are used for the drive from the motor to the spindle, there being no idlers or intermediate shafts.

The base ways are 31/2 inches wide one being flat and the other vee and have an overall width of 161/2 inches Both the base ways and the wheel-slide ways are forced-feed lubricated.

Table speeds for hydraulic traverse machines range from 6 inches per minute to 22 feet per minute and on mechanical traverse machines from $7\frac{1}{2}$ inches to about 91/2 feet per minute.

The machine weighs, complete with motors, approximately 13,000 pounds for the 36 in. length and 26,000 pounds for the 192 in. length. It requires a flor space from about 7½ feet in width (8% feet when a hydraulic wheel head tnverse mechanism is supplied) by lengths ranging from 12 feet for the shortest machine to 38 feet for the longest.



Norton 16-In. Type C Cylindrical Grinding Machine

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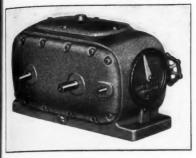
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Link-Belt Variable-Speed Transmission for Fractional Horsepower Duty

A novel self-adjusting, positive variable-speed transmission for fractional horsepower duty, known as the Link-Belt V.P.D. (Variable Roller Drive), is being announced by Link-Belt Company, 912 S.



Link-Belt Variable-Speed Transmission for Fractional Horsepower Duty.

Michigan Ave., Chicago, as a companion to their P.I.V. Gear variable speed transmission announced about 5 years ago for larger capacities.

The V.R.D., which is capable of a horsepower output of $\frac{1}{12}$ h. p. at maximum speed, with a maximum ratio of speed variation of 10 to 1, continues such features as compact all-metal construction, total enclosure, self-lubrication in an oil bath, protection from moisture and grit, and the use of a chain for transmitting the power positively.

Novelty in the V.R.D. consists in the construction and application of the chain which is used for transmitting the power from input to output shaft. It is sidecontact roller chain, consisting of steel links, made endless and connected by hardened steel pins in hardened steel joint bushings.

Openings in each pitch of links provide a pocket for each of two hard steel rollers, and from both sides a portion of oller protrudes sufficiently to permit ach pair of chain rollers, at each engagement of chain and wheels, to roll into contact with the hardened steel conical opposed discs forming the driver and driven wheels, until finally the chain is engaged positively in the wedge-shaped wheels at the proper pitch line for the speed desired on the output shaft. The disengagement of chain also takes place with a smooth, rolling action.

A speed indicator permits ready checkup on operating speed settings. Spring pressure applied to the two discs of one wheel serves to maintain correct tension and compensate for natural chain wear automatically.

The V.R.D. is furnished with horizontal or vertical box; with or without reduction gearing; and can also be supplied motorized, with motor forming an integral part of the unit.

American No. 650 Welding Helmet

The No. 650 welding helmet developed by the Safety Engineering Bureau of American Optical Company, Southbridge, Mass., is particularly suited for work in confined spaces such as tanks, ship hulls, locomotive front ends, fire boxes, and other places of a similar nature.

Designed to fit closely to the face and sides of the head without sacrificing ventilation or causing light leaks, the helmet is cool and comfortable under the most humid conditions. The Bakelite welding glass holder is outside of the helmet and is fully dielectric. It assures the wearer of freedom from burns if accidental contact is made with the electrodes while working. The added distance from the face to the welding plate permits the helmet to be comfortably



American No. 650 Welding Helmet

worn with a respirator and also helps to prevent fogging. Noviweld glass, which screens out more than 99½% of all injurious light rays, is standard equipment.

A swivel connection between the helmet and headgear provides three positive positions in which the helmet can be set when in use. Looseness, slipping and

PRO

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sideplay are eliminated. The entire unit is extremely light in weight and the balance between the headgear and the helmet increases the speed and positiveness with which the helmet can be set in position.

American Optical Company has prepared an illustrated folder describing the new 650 Welding Helmet which they will be glad to send to anyone interested. Address: American Optical Company,

Southbridge, Massachusetts.

50

Stanley Toolroom Grinder No. 585

Stanley Electric Tools, New Britain, Conn., has brought out a toolroom grinder-the No. 585-which is said to

Stanley Toolroom Grinder No. 585 with Accessories

be capable of innumerable uses. the grinder mounted in a lathe, shaper, milling machine, planer, or in a special Stanley bench stand, a variety of abra-sive wheels—either straight or mounted -may be used to grind openings in dies and jigs of all kinds, or keyways, alon or other apertures.

The tool can also be used for man other kinds of external and intern grinding operations. As a hand tool can be used to grind machine parts ar for rough grinding on small castings of forgings. With a metal cutting bit can be used to machine aluminum me terns, brass templets, and for simil work on all non-ferrous metals.

Stanley Toolroom equipped with a 3/8 h.p. 18,000 r.p.m. Un versal motor, and will drive a 1½x½ h wheel under considerable pressure. The grinder is furnished complete with motor unit holders, wheels, bit wrenches, and lubricant as illustrated. These accessor

ies, together with motor unit. into a compact metal carrying a which keeps the unit together to storing or carrying from job to jo

Portable Brinell Testing Instrument

A new form of portable testing instrument for making readings Brinell hardness numbers is bein placed on the market in this com try by the R. Y. Ferner Co., In vestment Building, Washington D. C. By the use of three str of steel balls furnished with the outfit and different pressures, iti possible with this equipment i measure the hardness not only steels, cast iron and hard bronze but also the softer metals, including lead and copper.

This Brinell press is designate as Type M 60/750, the figures rep resenting the range of pressures kilograms that can be used with the instrument. It consists of tapered piece of steel seven inch long and weighing about 34 of which is slit, by sawing, from the smaller end to within three-qu ters of an inch of the larger el In one surface of the larger end inserted a holder with a steel be of which three sizes are furnish of 10 mm, 5 mm and 2.5 mm diam eter. In the opposite side may inserted any of three threat One of these has holders. spherical top for use of the pr between the jaws of a vise

in an arbor press for applying the presure. The second is a Morse Com No. 2 to hold the instrument in a dr The third is a square holder, h an inch square in cross section, for it sertion in the tool post of a lathe,

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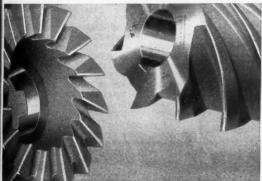
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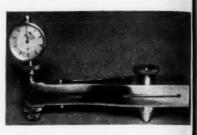
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B. C. AMES COMPANY WALTHAM, MASS. make tests of pieces while they as mounted for machining.

In the lower of the two prongs, at the small end, is mounted an adjustable screw which can be locked in position. In the upper prong is mounted a small dial indicator which is held in place by a locking nut. This dial is graduated the hundredths of a millimeter, can easily be read to 0.001 mm and has a range of over 3 mm movement. The dial includes an indicator of the whole millimeters.

When this press is to be used, the



Portable Brinell Testing Instrument

adjustable screw is set against the contact plunger of the dial indicator so that the latter reads zero with no load applied, and is then locked in that pos-Then the steel ball in the opposite end is placed against the piece to be tested, either in the jaws of a vise of under the spindle of a drill press or on a lathe, and the pressure is applied until the dial indicator shows by its reading the position of the adjustable screw with reference to the upper prong correspond-This posting to the pressure desired. tion is given by a chart furnished with the instrument showing the calibration of the dial for the different loads that would ordinarily be used. The ratio of readings of the dial indicator to increments of load is practically linear and amounts to about 0.0018 mm per kilo-The press contains a device to prevent overloads greater than 10 per

For reading the diameter of the impression made by the ball, a special magnifier having a cam-shaped dial is supplied with the outfit. This dial also shows the corresponding Brinell number for the 750-Kg load when using the 5-mm ball. The dial also has a scale of tensile strength of steel in pounds per square inch corresponding to the Brinell readings. For determining the Brinell numbers for other loads and other diam-

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eters of ball, a book of tables of Brinell numbers corresponding to each 0.01 mm in diameter of the impression is fur-nished with the outfit. The load of 750-Kg with the 5-mm

ball gives the same Brinell numbers as the usual 3000-Kg load with a 10-mm ball and is used for cast iron, steel and hard bronze over 3 mm thick. For these materials when less than 3 mm thick the 25 ball and a load of 187-5 Kg are suggested. The 5-mm ball with a load ed, the of 250 Kg is recommended for brass, bronze and hard copper over 3 mm thick or the 10-mm ball and the same load are suggested for lead over 6 mm thick. For brass, bronze and copper less than mm thick a load of 62.5 Kg and the 25-mm ball are recommended, and the same load with 5-mm ball for lead and sinc over 3 mm thick.

The outfit also includes a standard test piece of steel with an impression on it and its value. The whole outfit with box and the various accessories mentioned weighs only 5 lbs. and so is readily portable for use in any part of the shop where means are available for applying

sufficient pressure.

Lincoln "Super-Visibility" Welding

The Lincoln Electric Company, Dept. M-3, Cleveland, Ohio, is now offering to users of welding equipment a "Super-Visibility" welding Lens which is said to be so made that it absorbs all objectionable ight rays while at the same time hold-ing visibility at a point which permits a dear view of the work without tiring

The experienced user of welding apparatus knows that the energy given out by the welding arc in the form of light embaces not only the visible rays to which the retina of the eye is responsive, but also the short infra-red rays and the long ultra-violet rays which, while normally invisible to the eye, are capable of serious visual injury. A lens of cornet type will absorb the extremely short and long light rays, permitting visibility without injury to the eye. The quality da lens is dependent upon its efficiency n absorbing the injurious rays. Lincoln "Super-Visibility" lens has been spicted to tests by the U. S. Bureau of Sandards, and the Bureau reports that the injurious light rays are absorbed 100 per cent.

The Lincoln lens is made in two shades, which may be selected according to the brightness of the arc; either light



14400 Woodrow Wilson Avenue

Detroit, Michigan

54

or dark. The light "A" lens is for metallic arc welding and the dark "B" lens is for carbon arc and heavy metallic arc work. The standard size of the lens is $2x4\frac{1}{2}$ inches.

Fafnir "Type G" Ball Bearing Simplifies Mounting and Housing Design

A type of ball bearing which entirely eliminates one of the two shoulders formerly required in the housing where it is necessary to provide for taking a cer-



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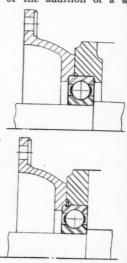
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tain amount of thrust in both direction has recently been put into production by The Fafnir Bearing Company, New Britain, Conn.

Simple enough in design, it consists merely of the addition of a wire ring



Drawing illustrating design of Fafnir "Type G" Ball Bearing

snapped into place in a groove cut on the outside of the bearing outer ring. This wire is placed near one face of the bearing, as shown, and, protruding one-eighth inch or so, furnishes a shoulder integral to the bearing itself, which abutting against the face of the housing does away with the need for a shoulder on the opposite side of the bearing. This will be clearer by a glance at the accompanying typical installation. It will be apparent also that not only is the hous-

SAVE SPACE TIME AND LABOR

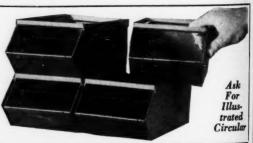
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ing design greatly simplified, but assembly is facilitated and considerable space saved in the overall length of the application. This latter feature is particularly advantageous in automobile design and in all applications where compactness is essential or where the weight of the bearing housing is a factor.

The drawing shows the relative saving in space by the use of the bearing. The fact that the housing may be bored straight through from one side is of great assistance in reducing machining costs also. The question arises whether this added snap ring can absorb sufficient thrust to make it a safe feature to incorporate in a bearing, but three years of research have proven conclusively that the capacity of the bearing is in no way lessened and that for applications where thrust is an incidental feature only, or where the housing shoulder serves the purpose mainly of locating the bearing on the shaft rather than absorbing purely thrust loads, this integral shoulder on the bearing is fully as satisfactory as the more complex one provided

in the housing. This bearing, designated by the letter G appearing after the bearing number, is available in eight popular sizes of the light 200 Series Single Row, and seven

sizes of the medium 300 Series, according to the specifications following. Grease Seals can be furnished, just as in the case of the standard Single Row Bearing. and either the maximum capacity or non-filling slot type supplied, according to the user's preference and the service to be encountered. In the maximum type bearing the wire ring is placed on the side opposite the filling slot, and in the case of the grease seal bearings on the side opposite the seal.

In general, the wire is placed about one-eighth in. from the face of the bearing in a groove approximately 5/64 in. wide and 1/16 in. deep, although these dimensions vary slightly for dif-ferent sizes as can be seen from the

specifications.

Dixon Graph-Air Gun

In order to simplify the use of the Microfyne Flake Graphite made by the Joseph Dixon Crucible Co., Jersey City, N. J., this firm has brought out a lubricating device to be known as the "Graph-Air Gun". The gun is made of rubber, and when squeezed deposits the graphite where needed in measured amounts through positively controlled air pressure.

In order to fill the gun, the head is unscrewed, exposing a large opening

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through which is inserted an "easy-pow chute-spout" that is attached to the ca of graphite. A 2-inch nozzle is standar with each gun, but an 8-inch nozzle as be supplied if desired. A plug fitted to the bottom of the gun and easily snapped in and out carries a disc of chamois for use as a burnisher.

The volume of graphite deposited by



Dixon Graph-Air Gun. The lower illustration show how the gun is opened and closed. I gun with 8-in. nozzle is also shown.

the gun is controlled by the position of the nozzle in relation to a graduated did on the top of the gun. When not in us the dial may be turned to "shut" position, making it practical to carry the gradual to the stop of the gradual to the g gun in a tool-kit without danger of spilling the graphite.

"Go-Det-Co" Positive Drive Holder For Woodruff Keyway Cutters

The latest addition to the line of tools marketed by the Goodspeed-Detroit Company, 2832 East Grant Blvd., D troit, Michigan, under their trade name "Go-Det-Co," is a positive drive holds

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for Woodruff Keyway Cutters in which there is an accurately adjustable stop to back up the cutters, giving a range of adjustment within the holder of 1/4 inch and providing for adjustment to within one or two thousandths of an inch.

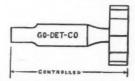
Another valuable feature of this holder sited by is that it clamps the cutters in position without changing their location. It will be readily apparent that by using this holder and a controlled-length keyway cutter, which is a product of this same company, no further adjustments of



either the cutter or the machine table will be necessary after a production job has once been set up. It is necessary only to place the new cutter in the holder against the stop, lock it in position, and proceed with the assurance that the location is correct. The cutter cannot slip; thus the danger of spoiled

Keyway Cutters

work due to slippage is eliminated. The holder can be furnished with either No. 9, 10, or 11 B & S taper shank and in either the regular tang or draw-

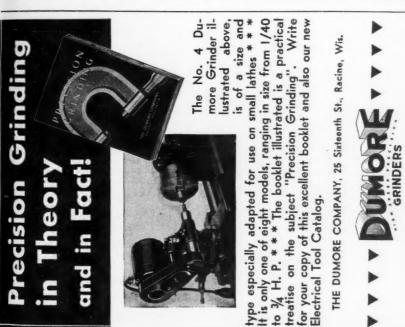


"Go-Det-Co" Controlled Length Keyway Cutters Woodruff

bar type. Cutters can be supplied in all standard sizes.

Murex Coated Welding Electrode for High Carbon and High Strength Steels

Difficulty in arc welding steels containing more than .20 per cent carbon is overcome by a new heavy coated electrode, known as "Murex Special A," according to announcement by the Metal & Thermit Corporation, 120 Broadway,



58

New York City. The new electrode, an improvement of a previous design, hinders the migration of carbon from the parent metal to the deposited metal when welding and assures a more ductile deposit. Sound, dense, X-ray-clean welds, having excellent penetration, can

Perfect full-cupped fracture obtained at 73,000 lbs. per sq. in. in weld metal specimen made with Murex Electrode for welding high carbon steels.

be made in high carbon steels with perfect ease with this new addition to the Murex line, it is claimed. The deposit, containing a small quantity of nickel, has unusually good physical properties and stress-relieved, all weld metal speci-

mens invariably show clean full-cupped fractures under test. The tensile strength of these deposits is 73,000 lbs. per a inch and the yield point 59,000 lbs. per sq. inch. The elongation in 2 inches is 31 per cent, and the reduction in are is 63.5 per cent.

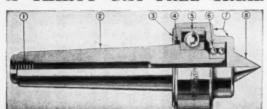
Other recently developed Murex electrodes, designed for use with the latest high strength steels now make it possible to obtain welds with tensile strengths of 85,000 to 100,000 lbs. per sq. inch. Such high strengths are obtained by including Nickel or Molybdenum, or a combination of these elements in the deposited metal. For example, one of the new electrodes, depositing $2\frac{1}{2}$ per cent Nickel, is being used extensively in the welding of steels of this same analysis for low temperature work where welds must show Charpy impact resistance of 10 to 24 foot-pounds at the extremely low temperature of 75 degrees Fah. The physical properties of this weld metal are it is said, extraordinary. Tensile strengths average 86,000 and yield points 72,000 lbs. per sq. inch. The elongation in 2 inches is 25.5 per cent. The reduction in area is 64 per cent. And, almost without exception, test specimens show clean, fully cupped fractures.





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U. S. Hi-Speed Grinder

A portable electric grinder, especially designed for the particular class of work for which it is intended, has been brought out by the U. S. Electrical Tool Company, 2471 West 6th St., Cincinnati, Ohio. The tool is designed and built for continuous production service on such work as the removing of excess stock and for finishing operations in automobile body plants, foundries, die and mould shops, pattern shops and so on.

Ease in handling is a feature of the tool. Power is supplied through an universal motor, for operation on direct or alternating current of 60 cycles or less, running in precision ball bearings that



U. S. Type H. S. G. 20 Hi-Speed Grinder in Action

are enclosed in dust proof housings. The entire mechanism is protected by a rugged die cast aluminum housing. Power is controlled by means of a quick make and quick break trigger switch. The wheel arbor is held by a three-jaw geared chuck, the mechanism of which is protected by the housing.

The "Hi-Speed" grinder can be furnished in either of two sizes, both having a motor no-load speed of 17,000 r. p. m. with or without the back handle. Without the back handle, the type H. S. G. 20 ginder is 15 inches long and weighs 1½ lbs. The type H. S. G. 18 grinder with back handle, is 15½ inches long and weighs 5½ lbs. Either grinder takes a wheel of two inches maximum diameter.

A 3-jaw geared chuck, chuck key, and fonductor rubber covered cable and standment plug are supplied as standed equipment. Grinding wheels and mary milling files in a wide variety of shapes and sizes can be supplied for use with the Hi-Speed Grinder.

Anderson Improved Balancing Ways

No Leveling Required

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in. 40 in. 60 in. 72 in. 96 in.	20 in. 30 in. 30 in. 66 in.	1,000 2,000 2,000 5,000 10,000



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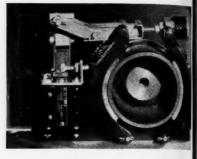
Davenport, Iowa

Cutler-Hammer Solenoid Operated Electric Brakes

A line of small A.C. and D.C. solenoid-operated brakes is announced by Cutler-Hammer, Inc., Milwaukee, Wisconsin. Three new brake sizes are included with torque ratings ranging from 3 lbs. feet to 75 lbs. feet. These torque ratings are in accordance with NEMA standards, conforming closely to the full load torque ratings of small standard motors.

The brake wheel is relatively large, allowing low total brake shoe pressures, which, distributed over the large brake

lining area, results in low unit presum on the lining and therefore long, enewear of the friction surfaces. The low shoe pressure also results in low stress on all pins and pivot points, assuring longer wear for these parts, and allow the use of a small operating solenois which requires less current, thereby at



Cutler-Hammer Solenoid-Operated Electric Brake as applied to a small pulley.

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fecting a slight saving in operating cost of the brake.

Dimensions of the A.C. and D.C. brake are interchangeable, so that machine designers can provide standard mounting holes and apply either the A.C. or D.C. brake as needed. Brake shoes use moulded brake lining and provide 180 degrees of braking service.

These new brakes are intended for applications on machine tools, conveyous small hoists, dumb waiters, overhead door hoisting equipment, small eleators, printing presses, laundry equipment and similar small machines where quick sure stops are required. Descriptive Bulletin No. 511 can be obtained from the manufacturer.



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"Ideal" Speed Lathe

The illustration shows a speed lathe The Hustration shows a speed lathe that has been placed on the market by the Schauer Machine Company, 905 Broadway, Cincinnati, Ohio. The machine is intended for use in finishing and polishing small parts. The construction of the lathe includes an automatic braking choice of two speeds, ball earings, extension and motor spindle



to take an extra long rod stop or hollow spindle, universal or collet chuck, and totally enclosed dust proof motor.

The speed desired is selected by means of a speed control switch in the motor base. Current is cut in by a slight backward position on the hand lever. The current is cut off and the brake is simultaneously and automatically applied by a forward movement of the hand ever. The braking is smooth and stops the motor in three seconds when running at high speed.

The motor is 1/2 h.p. and of two speed design. It is stated that this motor will mente continually without over-heating, yet is totally enclosed and dust proof.

An extension within the motor spindle permits insertion of 1-inch rod or tube sop 9 inches long from the face of the

chuck, thus making it possible to finish 12 in. to 16 in. rods without the necessity of a support. The lathe is regularly equipped with a 4-inch 3-jaw Universal chuck to take 1 inch rod or tube stop and to chuck up to 4 in., or a ½-in. to ½-in. collet chuck for special work.

Double row ball bearings of ample size. dust proof and operating in grease, are mounted on both chuck and rear ends of This equipment can be furnished for bench mounting, as illustrated, or with a pedestal for floor mounting.

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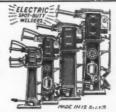
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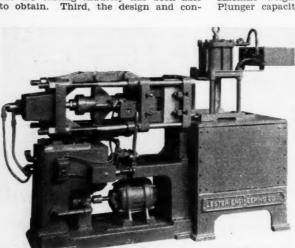
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CIF

Lester Die Casting Machine

The Lester Engineering Company, Roseland and Arabella Rd., Cleveland, Ohio, has completed the development of its No. H-AP-1 Die Casting Machine, shown in the accompanying illustration.

There are three fundamental advantageous features claimed for this machine. First, the high speed of production is evidenced by the machine's ability to set a pace of well over 600 operations per hour. Second, the quality of the finished parts produced in this machine is on a par with the best results the die casting industry has been able to obtain. Third, the design and con-



Lester Die Casting Machine

struction is such that all vital members are most accessible, breakage and wear are eliminated, time for job changes minimized and operation simplified.

The operation of the No. H-AP-1 Die Casting Machine is semi-automatic, being entirely controlled by one lever. Moving the lever toward the operator closes the die hydraulically. As soon as the die is completely closed and locked, the plunger operates, forcing the metal into the die. The plunger remains down, holding pressure on the metal for as long a period of time as is required for the particular part being cast. The plunger then returns to its original position and by moving the lever away from the operator, the dies are again opened. There

is an easily accessible adjustment when makes it possible to vary the time dewhich controls the opening of the defrom ½ second up to 35 seconds. In device also acts as a safety factor apprevents the opening of the dies until in metal has set.

The following are the specifications

The high producti speed is obtained ! means of a fast mor ing hydraulic togg mechanism for di movement. This de vice is positive acting developing a s locking pressure of tons. This power on large cores. In on junction with this d operating mechani is an automatic plu ger control which eliminates all lost tim between the vario phases of the cycle of operation.

Since the metal is be cast is injected in to the die by the solid displacement method the quality of the solid part, in spect to solidity as surface finish, is the best obtainable. The injecting device is a surface is a surface in the surface in the surface is a surface in the surface is a surface in the surface in the surface is a surface in the su

constructed as to function properly is the life of the vital parts. Wear between the plunger and metal cylinder is automatically taken up and metal pressur is always maintained. Automatic plunger control leads to uniformity of results by eliminating the human element and therefore to minimization of scrapage.

The design of the machine was prodominated by a desire to make it simple and rugged, and to eliminate breakag and wear but still maintain the feature of quick set-up and accessibility. Discan be changed in a minimum of time there being only one adjustment necessary. Two larger sizes of this type of Die Casting Machine are being developed.

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UNIVERSAL ENGINEERING CO.,

Frankenmuth, Michigan

Osgood Safety Filegrip

Injury, soreness, and fatigue resulting from holding a file in the usual manner while hand filing can be eliminated by the use of an Osgood Safety Filegrip, according to the manufacturers of the



File Equipped with Osgood Safety Filegrip

filegrip—the J. L. Osgood Machinery & Tool Co., Inc., 43 Pearl St., Buffalo, N. Y.
The Safety Filegrip is made of soft, pliable rubber, formed with a slot that allows for slipping the filegrip over the

pliable rubber, formed with a slot that allows for slipping the filegrip over the end of the file, and made to a shape that provides for gripping the file easily with the fingers. The filegrip can easily be applied to or removed from the file, but will not slip off while in operation.

A New Stripping Test for Udylite Coatings

Users of the Udylite coating process are usually interested in knowing the thickness of the coating that has been applied to their products, and for the purpose a test is used that is know the ras the "stripping" process. It is necess omparisary to know definitely the thickness of he plate that is formed on different materials so or tunder varying conditions, in order to be the purpose of the plate that is formed on different materials so or tunder varying conditions, in order to be

able to accurately specify mprove the kind or thickness of the recoating desired, and there is that has been no method objections as simple or aities. A accurate as the "strip tion of method.

Tests that have been used previously are what is known as maximum thickness tests, and it is said by the Udylite Process Company, 3937 Bellevue Ave. Detroit, Michigan, that these tests do not show the weak points of the plates and therefore, do not give a definite indication of the value of the coating.

Now, however, this company has brought-eaut a stripping test that is said to indicate the minimum thickness accurately. It also shows the actual thickness of the plate at any one point. Thus it will point the way to improved plating practice where such is needed. If the stripping test shows small individual areas of thin plate on an area with otherwise heavier plates, one can be sury if that



BALANCE

Today's buyers of equipment demand smooth operation. To insure it, such parts as clutches. flywheels, pulleys, fans, auto wheels, etc., must be balanced with precision. The Micro-Poise Precision Balancing machine detects unbalance to extreme accuracy and measures depth to drill to correct it. It's simple. accurate. fast, efficient.

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or this at the cleaning can be improved upon. know the recesses show a very thin plate in neces omparison with the protruding points, less of he plater knows at once that his rackfferenting arrangement is not what it should terials to or that his solution is off.

to be The new stripping test is a decided specify mprovement over the old one in several less of other respects. One very important item there's that its action is independent of the od ofpresence of minute amounts of impuror asities. Another advantage is that the ac-'strip"tion of the new test is independent of the nature of the base metal. The man-

thickness of the plate is at least 0.00005 inch. The film is now removed by rinsing in the solution 5B, then rinsed in water, and immersed for another 15 seconds in 5A. The inspection now shows whether or not the minimum thickness is greater than 0.00010 inch. This procedure is repeated until the base metal is reached, and the number of immersions required indicates the thickness of the plate.

The manufacturer states that in view of the superiority of the new test, the old one is being discontinued.



sury il that is needed to accurately determine the nickness of a cadmium coating is shown in is photograph. The test equipment consists i two bottles of reagent and two small dishes.

placturer states that the old test was lways unreliable on cast iron.

The method of testing is very simple. I'wo solutions are used, identified as 5A ind 5B. The solutions are poured into wo testing cups, then the object to be ested is immersed in the cup containing he 5A solution and held there for 15 econds. It is then rinsed in water and inspected. If the whole surface is covred with a brown film, the minimum



Note Saw Tooth

The ever increasing demand for Modern Colleta during the past twelve years is largely due to the development of the Double Saw Tooth serration. This serration, as the name implies, presents a series of wide, sharp surfaces that grip the stock so securely that all slippage either radially or longitudinally, is entirely eliminated. Much less locking pressure is required, which means a saving in power and longer life for the locking mechanism.

"Specify Double Saw Tooth" serrations as an insurance against slippage . . . "The Collets with the Positive Grip."

Write for Catalog No. 31

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Migrs. of all types collets, feed fingers, alloy
steel cams, chucking fingers, collet and pusher
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HIGH SPEED POLISHING at Lowest Costs



Gorham "Flint Alloy" Lathe and Grinder Centers

Centers of a permanently hard wearresisting material called "Flint Alloy," for use in the head and tailstocks of lathes and grinding machines, have been placed on the market by Gorham Tool Company, 14400 Woodrow Wilson Ave., Detroit, Michigan.

Economy is combined with efficiency in the design of the center, the center proper being butt-welded to a carbon steel shank. The use of the Flint Alloy is



Gorham "Flint Alloy" Lathe Center

not confined to the tip, however; the Flint Alloy is used for the entire forward part of the center, thus assuring that a point of Flint Alloy will be available as long as the center is long enough to be useable. The manufacturer states that the center is chatter-proof, and that it has an unprecedented length of life.

The center can be furnished in Morse Taper sizes from 1 to 6; in Brown & Sharpe Taper sizes from 7 to 14, and in Jarno Taper sizes from 4 to 20. Special sizes or tapers can be furnished to cus-

tomers' requirements.

Knurled "Unbrako" Socket Head Cap Screw

A new kind of socket head cap screw, shown in the illustration, has been placed on the market by Standard Pressed Steel Co., Jenkintown, Pa. The interesting feature of the screw is the knurled head. The object of the knurling is to make the driving of the screw much quicker and therefore cheaper, which is an important consideration where large quan-

Improved DIE MAKING MACHINE With Its Many New Features Many will enable you to reduce the cost of labor on your dies, gages, cams, templates, stripper plates, experimental work, etc., from to 60 %. Send for our bulle-tin. No obligation. OLIVER INSTRUMENT

1430 E. Maumee Street, Adrian, Michigan

titles of screws are involved, as in thetandar construction of large automotive dies in rom 5 other products.

It is usual for a mechanic to three



Knurled "Unbrako" Socket Heau
screws in with his fingers wherever postable in order to save time. With smooth earbide head screws the fingers slip, where when the knurled "Unbrako" screws at turn used, the fingers are actually geared to the screws heads in process of threading forded in. making it impossible for the finger forded machine without mechanical actions and the screws heads in process of threading forded machine without mechanical actions are the screws heads in process of threading forded machine.

In intricate die assemblies it is ofte mechat found that a socket screw will be locate in a place that is difficult to get at wit a wrench, as, for instance, in the present in such cases pliers are usually resorted to. The manufacturer claims that actus tests have proven that the Knurled "In Produce and the marks" corner bear across the marks of the mark tests have proven that the Knurled "Un brako" screw has a torque five time that of a smooth-head screw, which i the case of a heavy die would mean th saving of a considerable sum. In addi tion to the increased efficiency, the screen is of neat appearance.

Permite Leaded Phosphor **Bronze Bars**

A forward stride in the production manufacture of special bearings, bushings, fittings and small parts is now possible through the development of Personal Control of the c mite Leaded Phosphor Bronze Bars, according to announcement by Aluminum Industries, Inc., 2440 Beekman St., Cin cinnati, Ohio.

Permite Bronze Bars are available is



THE RUTHMAN MACHINERY CO. Cincinnati, Ohio 536 E. Front St.

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as in the standard six-foot lengths in diameters dies in from \(\frac{4}{5} \) inch to 2 inches, by 1/16 inch steps. All standard bearing bronze alter three for manufactures of serew machine products, and those who manufacture screw machine products for manufacture screw machine products for manufacture screw machine products for manufacture will be a permitted Barrs as their own use, will hail Permite Bars as fording a real economy. It gives them stock of superior bearing qualities for grew machine or turret lathe production. it represents the first time that leaded earing bronze has ever been produced n machine lengths.

The stock possesses exceptionally free ver pos machining qualities. Using tungsten smooth carbide tools, it has been successfully where machined at speeds in excess of 1500 surwhere machined at speeds in excess of 1500 surrews are feet per minute, without a coolant.

The better gripping afmachined with this finish makes the free
machining qualities completely available
without excessive strain on the chucking
locate mechanism. This exclusive finish, combined with the easy machineability of bined with the easy machineability of the material, will often permit produc-

at with tion rates 50 per cent higher than those for drawn bar stock.

Producers of special bearings, and other parts of leaded bearing bronze, will readity appreciate the service process. d "Un time nich in if appreciate the saving possible through the elimination of the many operations necessary to handle individual castings. Fermite Bronze Bars are produced to metallurgically correct process, and are supervised in every phase of their manu-facture by the Permite metallurgical

laboratory.

Nelson Section Lines for Cross Hatching

Engineers and draftsmen will be intersted in a tool that has been placed on



Nelson Section Liner for Cross Hatching

market by The Nelson Section Liner, M N. Seventh St., DeKalb, Ill. The tool a called the "Nelson Section Liner" and is said by the manufacturer that perAsk for Catalog B

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The liner is made of Bakelite, a takes up no more room than an ording 12-in. ruler on the drawing board. In illustration shows how the liner is use it is placed against the T-square and a triangle is located in one of the note in the liner. Then as the lines a drawn, the liner is moved so that it

the draftsman.

The material is light in weight, but is strong and durable and corresponds thickness to the thickness of the mangles. The speed and accuracy possibly the use of this line undoubtedly at to the speed with which drawings can broduced.

triangle can be spaced as required

"Farrell-Birmingham Gear Data Book"

Thirty-six pages, $8\frac{1}{2}x11$ inches in a are required to present the gear data information that has been compiled the Farrell-Birmingham Company, in 381 Vulcan St., Buffalo, N. Y. This is formation is now presented to gear on neers, gear manufacturers, and gear use under the above title.

The data included in this book are in the result of over 90 years experience the making of gears for all kinds of inchinery, for use in all kinds of industry both heavy and light. Each kind a type of gear is discussed, with adultages and disadvantages of design apperformance.

The book gives tables for figure horsepower of gearing; Specifications if Pinion Steels and Wheel Steels; Table Dimensions of Rolling Mill Pinions; Disign of Gear Wheels; and a vast fund other useful gear information. A copy the Data Book can be had by addresing a request to the above address, using the firm letterhead.

New Manual Tells How to Fabrica Stainless Clad Steel

A comprehensive guide to the fabrication of stainless clad steel has been issued by the Ingersoll Steel and Discago (division of the Borg-Warner Company, 310 South Michigan Ave, Charles of Welding and Fabricating Procedum for IngAclad Stainless Clad Steel at takes up, step by step, the various methods of welding, soldering, lock searing, riveting, deep drawing, pickling, betreating, etc., encountered in fabricating products of stainless clad steel. In Manual contains many diagrams to guident to the stainless clad steel.

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A distinctive feature of the Manual is

an illustrated section showing actual installations and applications of IngAclad in a wide range of industries. These include the food, soap, chemical, paper, brewing, dairy, building, and other in-dustries that have used the material and subjected it to all of the procedures described in the Manual.

Other sections of this attractively prepared booklet are devoted to a description of the method of producing IngAclad by the original welded-in-the-ingot process, the physical properties of the clad

material, etc.

A copy of the booklet can be obtained by addressing a request to the firm as above.

"Precision Measuring Devices"

Catalog No. 6A, now being issued by Standard Gage Company, Inc., Poughteepsie, N. Y., contains 72 pages of descriptions and photographs of the "Standard Limit" gages made by this firm. The line includes standard dial

indicators in various types and designs as required for different types of work, dial depth gages, dial pin gages, dial comparators, dial plug gages, adjustable limit snag gages, adjustable limit length gages, adjustable limit pin gages, taper gages, spline gages, ring gages, and other

tools made by this firm.

Two pages of the book are devoted to tables giving the limits for use with plug gages or snap gages with the shaft as a basis and with plug gages or snap gages with the hole as a basis, as defined according to the "Standard" Limit Gaging System. It gives maximum and minimum limits for light running fits, running fits, sliding fits, push fits, driving fits, light force fits, and force fits, for the various diameters from 3/64 in. to 153/4 inches. These tables of "Standard" limits should be in the hands of every machine shop executive,

engineer, and tool engineer. Copies free upon request.

"THE SOLID SHIM THAT PEELS:" In this 8-page booklet the Laminated Shim Company, Inc., 2126 44th Ave., Long Island City, N. Y., explains the advantages of the solid laminated brass shims made by this firm. The booklet is prophotographs with illustrated fusely showing how the thin sheets of brass are bonded together, a variety of the shapes in which laminated shims may be obtained, and a number of representative products in which laminated shims are used.

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The ease with which any thickness of shim can be "peeled" and the accuracy of the shims are explained in detail. The shims are standard in thickness of from 1/64 in. to 3/16 in. with 0.002 or 0.003 in, laminations. No

filing or machining is required; laminations are stamped from sheet brass and any thickness of shim desired can be peeled from the block.

A copy of the booklet is available to

any mechanical executive upon request.

Unique Gate-Valve "Cut-Out" Shows What Jenkins Offers

An unusual piece of valve literature is the 12-inch "cut-out" replica of a Jenkins Standard Iron Body Gate Valve that is being sent out to users of valves by Jenkins Bros., 80 White St., New York, N. Y.

The cut-out is the next best thing to having the real Jenkins Gate for inspection, as it provides an exact reproduction of both the exterior and the mechanism of a big, heavy Jenkins valve. An accurate listing of the features of Jenkins design and construction also is given in a form that makes it convenient for valve users to follow the suggestion to "com-



They'll Help

The New Buckeye Stock list "G" is enabling many manufacturers to quickly select the right bushings for specific requirements. In addition, the New Electric Motor Bearing list is also proving very helpful. These folders are ready for you and will be sent without obligation.

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New York, N. Y. 562 W. 52nd St.

CUTTER, WOOD & SANDERSON CO. Cambridge, Mass. 222 Third St.

pare point-for-point with other good valves.

One of the cut-outs can be had by addressing the Jenkins company at the above address.

> Data Sheets on Special and Alloy Steels

A loose-leaf booklet containing 10 data sheets on Hy-Ten, Economo, and S. A. I. alloy steels is now being issued by Wheelock, Lovejoy & Co., Inc., 130 816. ney St., Cambridge, Mass.

The data sheets give heat treating instructions, physical properties, and data as to common uses of a wide rang of special and alloy steels from .15 to 1.00 per cent carbon content.

The information carried on the sheets should be of prime value to purchasing agents or engineers who are concerned with the specifications of materials for machine or tool parts. A copy of the booklet will be sent to any mechanical executive, engineer, or purchasing agent upon request.

Light Metal Data for Engineers and Designers

A data book on light metals, intended for the engineer and user of metals, he been issued by the Dowmetal Division, Dow Chemical Company, Midland, Michigan. The book explains how the world's lightest structural metal may be fabricated by the processes that are common to industry.

Accepted shop practice in the working of light metals is described and methods of welding, riveting, forming, and machining are discussed in detail. Various available forms of Dowmetal are listed and described, such as sand or die castings, extruded shapes, forgings, sheet plate, and strip metal.

Copies of the book may be obtained by

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DETROIT STAMPING CO. 3445 WEST FORT STREET, DETROIT (Est'd 1915) addressing the Dow Chemical Company as above.

ARMSTRONG - VANADIUM SUPER QUALITY DROP FORGED WRENCHES: The complete line of vanadium steel wrenches manufactured by Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., is described and illustrated in a new catalog that has been issued by this firm. The use of vanadium steel makes it possible to make a thin wrench, reducing the bulk and weight to the minimum, yet the wrench is strong enough to stand the hardest pull without breaking. Armstrong-Vanadium wrenches are guaranteed not to break or spread.

The catalog contains tables of specifications showing the length, size of openings, and weight for each wrench, according to the size of standard nut or take.

A copy of the catalog will be sent to any mechanical executive upon request.

COMTORPLUG AMPLIFIER NO. A2: A measuring internal gage that is easily operated, accurate, and durable is described in detail in a four-page folder that has been issued by The Comtor Company, Waltham, Mass. The tool, known as the Comtorplug Amplifier A2, consists of an amplifier and a number of interchangeable expansion plugs and reference standards, one for each size of hole Any plug can be placed in the amplifier in a few seconds.

When applied to the work, the Comtorping reads, directly on its dial, the exact undersize or oversize of the hole. To use, the expansion plug is contracted, placed in the hole, and released in gaging position. The tool is effective for discovering and exploring out-of-round, taper, and bell-mouth

conditions, or in measuring between flat surfaces.

Copies of the bulletin will be supplied upon request.

A Correction

The tool for cutting long cams in the shaper, described by Grant Villon on page 40 of the June, 1934, issue of MODERN MACHINE SHOP, was assumed by the editor to be "home-designed." On the contrary, the tool is a standard product of the Stockbridge Machine Co., Worcester, Mass., manufacturers of shapers and special shaping attachments.



No. 28 FOOT PRESS

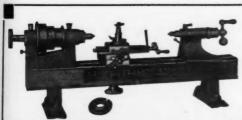
Do not misconstrue this machine with the ordinary Kick Press. It's different. Also manufacturers of Ball Bearing Punches, Shears, Angle Iron Machin e ry, Brakes, Punches and Dies of all description.

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Did You Know That ---

A self-adjusting, positive variablespeed transmission for fractional horse-power duty is now available? See page 49.

The world and everything in it is composed of but 92 elements? See page 28.

An electric brake especially designed for machine tool application has been placed on the market? See page 60.

You can cut a manganese bronze weld with a hack saw blade? See page 1.

A set of tables of fits and tolerances comprising the experience of many years in a large plant is now published for the first time? See page 16.

A dial thickness measure no larger

than a watch is now being made? See page 52.

Bars of Phosphor Bronze are now available in lengths up to 6 feet? See page 66.

. A "safety" filegrip will save your mechanics' hands and prevent cuts? See page 64.

Fibre can best be machined when it contains a certain amount of moisture? See page 44.

You can have a modern "live" ball bearing center to try on your own work for 30 days at no charge? See page 58.

You can now buy wrenches that are guaranteed not to break or spread? See page 71.

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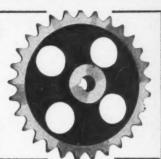
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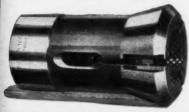
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